




Altering driving restrictions after median sternotomy

Richard Gach, PT, DPT^a , Susan Triano, MS, CCC-SLP^a , Doa El-Ansary, PhD^{b,c}, Robert Parker, PhD^d , and Jenny Adams, PhD^e

^aAcute Therapy Department, Memorial Regional Hospital, Hollywood, Florida; ^bDepartments of Physiotherapy and Surgery, The University of Melbourne, Parkville, Victoria, Australia; ^cDepartment of Health Professions, Swinburne University, Melbourne, Australia; ^dPrivate Consultant, Reno, Nevada; ^eCardiac Rehabilitation Department, Baylor Hamilton Heart and Vascular Hospital, Dallas, Texas

KEYWORDS Cardiac rehabilitation; driving restrictions; midline sternotomy; sternal precautions

Worldwide, median sternotomies are performed during an estimated 1 million procedures that include surgery for valve, transplant, and coronary revascularization surgery.^{1–3} These procedures have a risk of sternal wound complications that can lead to increased morbidity, poor quality of life, prolonged or recurring hospitalizations, higher health care costs, and mortality rates of 15% to 40%.^{4–6} The consequences of sternal complications can be so severe that physicians consider driving restrictions essential for the appropriate recuperation and benefit of the patient.⁷

Driving restrictions after median sternotomy differ between hospitals. The Cleveland Clinic advises patients not to drive for 6 to 8 weeks so the sternum has time to heal.⁸ The National Institutes of Health recommends the resumption of driving after 3 to 8 weeks,⁹ and the Heart Foundation advises patients to not drive for 4 to 8 weeks.¹⁰ Sometimes, advice is spontaneous and superficial, encouraging patients who “have to ride in a vehicle” to “sit in the back seat,” “do not wear a seat belt,” “lay down in the back seat,” or “sit in a seat that does not have an airbag.” The medical restrictions related to driving are not only unsatisfactory¹¹ but also differ considerably between physicians.¹²

There are two primary reasons for driving restrictions following median sternotomy. First, there is concern that frontal or lateral plane forces¹³ on the sternum (similar to motions of the arms and trunk during driving maneuvers) may compromise healing of the bone. In a pilot observational study using a driving simulator, the physical effects of driving tasks (reaching for the seat belt, driving on a straight path, rotating the head and trunk to perform reverse parking) on sternal micromotion were measured using ultrasound. It was reported that all tasks resulted in minimal sternal motion with no significant increase in pain or discomfort.¹⁴ Findings from

a recent study demonstrated that various upper limb tasks performed by patients within the safe limits of pain and discomfort after median sternotomy resulted in minimal bone motion with no adverse events.¹⁵ Second, seat belt forces and airbag deployment may damage the healing sternum during a motor vehicle crash. Unquestionably, there are documented accounts of sternal fractures from motor vehicle accidents¹⁶ associated with the use of seat belts¹⁷ and the deployment of airbags.¹⁸ It is interesting that in these reported accounts, drivers who endured sternal injuries had intact sternums before deciding to drive their motor vehicle that particular day. Hypothetically, every time all individuals (regardless of whether they have had a median sternotomy) decide to drive, they are taking the risk of having a motor vehicle accident that may result in sternal fracture from the force of the seat belt and/or deployment of the airbag. Regardless of the risk, it has been well documented in the literature that combined airbag and seat belt use prevents a driver's chest from striking the steering wheel, reduces injury,^{19,20} decreases mortality,¹⁸ and prevents death in motor vehicle accidents.²¹

Denying a person the ability to drive results in a seriously limited lifestyle²² and may have substantial negative ramifications on the lives of patients with cardiac disease.²³ Driving is one of the most significant and important activities of daily living in sustaining independence²⁴ and quality of life. Loss of driving privileges may result in an impaired ability to perform essential activities of daily living.²⁵ Reduced mobility may then manifest in depression²⁵ and increased emotional stress⁷ and have a negative impact on employment²³ and economic status.^{7,23} Those who are advised to not drive are likely to suffer social isolation²⁶ and perform fewer out-of-home activities,^{25,26} which causes increased risk of mortality.²⁶

Corresponding author: Richard Gach, PT, DPT, Acute Therapy Department, Memorial Regional Hospital, 3501 Johnson St., Hollywood, FL 33021 (e-mail: RGach@MHS.net)

Received October 6, 2018; Revised November 12, 2018; Accepted November 15, 2018.

Eligible median sternotomy patients are typically referred to a medically supervised outpatient cardiac rehabilitation (CR) program, which enhances the physical, mental, and social function of cardiac patients.²⁷ There is a 1% reduction in mortality rate for each session of CR attended.²⁸ Despite the clear benefits of CR, programs remain underutilized,^{27,29} because only 31% of eligible patients participate after coronary artery bypass grafting.²⁹ Transportation issues are a common reason for poor attendance in CR.^{27,30} Ironically, patients are advised to enroll in a CR program at hospital discharge and then, at the same time, advised not to drive.

Improvement in standardized information given to patients about driving restrictions is necessary.²³ Patients with a median sternotomy, like all drivers, should be advised that wearing seat belts and driving a motor vehicle with airbags is advisable to ensure safety on the roads. Patients who are not having medication symptoms or ensuing postsurgery pain should be released to drive so that they can expedite their enrollment into a CR program, resume activities of daily living, and reclaim their quality of life.

ORCID

Richard Gach  <http://orcid.org/0000-0003-2583-9577>

Susan Triano  <http://orcid.org/0000-0001-6657-104X>

Robert Parker  <http://orcid.org/0000-0002-8835-8749>

- Satsangi DK. Search for the best heart valve—from replacement to repair. *Ind J Thorac Cardiovasc Surg*. 2011;27(4):152–160. doi:10.1007/s12055-011-0119-z.
- Taylor DO, Edwards LB, Boucek MM, et al. Registry of the international society for heart and lung transplantation: twenty-fourth official adult heart transplant report—2007. *J Heart Lung Transplant*. 2007;26(8):769–781. doi:10.1016/j.healun.2007.06.004.
- Nalysnyk L, Fahrbach K, Reynolds MW, Zhao SZ, Ross S. Adverse events in coronary artery bypass graft (CABG) trials: a systematic review and analysis. *Heart*. 2003;89(7):767–772. doi:10.1136/heart.89.7.767.
- Loop FD, Lytle BW, Cosgrove DM, et al. J. Maxwell Chamberlain memorial paper. Sternal wound complications after isolated coronary artery bypass grafting: early and late mortality, morbidity, and cost of care. *Ann Thorac Surg*. 1990;49(2):179–187. doi:10.1016/0003-4975(90)90136-T.
- Lucet JC, Parisian Mediastinitis study group. Surgical site infection after cardiac surgery: a simplified surveillance method. *Infect Control Hosp Epidemiol*. 2006;27(12):1393–1396. doi:10.1086/509853.
- Brocki BC, Thorup CB, Andreasen JJ. Precautions related to midline sternotomy in cardiac surgery: a review of mechanical stress factors leading to sternal complications. *Eur J Cardiovasc Nurs*. 2010;9(2):77–84. doi:10.1016/j.ejcnurse.2009.11.009.
- Zografos TA, Katritsis DG. Guidelines and regulations for driving in heart disease. *Hellenic J Cardiol*. 2010;51(3):226–234.
- Cleveland Clinic Heart and Vascular Institute. Diet and activity 2018. <https://my.clevelandclinic.org/departments/heart/patient-education/recovery-care/surgery/diet-activity#driving-tab>. Accessed September 24, 2018.
- NIH National Heart Lung and Blood Institute. Coronary artery bypass grafting. <https://www.nhlbi.nih.gov/health-topics/coronary-artery-bypass-grafting>. Accessed September 24, 2018.
- Heart Foundation. Heart information bypass. https://www.heartfoundation.org.au/images/uploads/main/Your_heart/Heart_Bypass.pdf. Accessed September 24, 2018.
- Kelly R, Warke T, Steele I. Medical restrictions to driving: the awareness of patients and doctors. *Postgrad Med J*. 1999;75(887):537–539. doi:10.1136/pgmj.75.887.537.
- Gillespie ND, McMurdo MET. A survey of attitudes and knowledge of geriatricians to driving in elderly patients. *Age Ageing*. 1999;28(1):53–57. doi:10.1093/ageing/28.1.53.
- McGregor WE, Trumble DR, Magovern JA. Mechanical analysis of midline sternotomy wound closure. *J Thorac Cardiovasc Surg*. 1999;117(6):1144–1150. doi:10.1016/S0022-5223(99)70251-5.
- El-Ansary D, Royse C, Linda D, et al. Motor vehicle driving after cardiac surgery via a median sternotomy: mechanical and cognitive considerations. *Heart Lung Circulation*. 2018;27(Suppl 3):S511–S512. <http://dx.doi.org/10.1016/j.hlc.2018.04.031>. doi:10.1016/j.hlc.2018.04.031.
- Katijahbe MA, Granger CL, Denehy L, et al. Standard restrictive sternal precautions and modified sternal precautions had similar effects in people after cardiac surgery via median sternotomy ('SMART' trial): a randomised trial. *J Physiother*. 2018;64(2):97–106. doi:10.1016/j.jphys.2018.02.013.
- Knobloch K, Wagner S, Haasper C, et al. Sternal fractures occur most often in old cars to seat-belted drivers without any airbag often with concomitant spinal injuries: clinical findings and technical collision variables among 42,055 crash victims. *Ann Thorac Surg*. 2006;82(2):444–450. doi:10.1016/j.athoracsur.2006.03.046.
- O'Malley MK, Duignan JP, Lavelle JS. Fractured sternum associated with the use of seat belts. *Ir Med J*. 1983;76(3):131–132.
- Kapisiz NS, Ozpolat B, Kapisiz F, Yucel E. Sternal fracture due to airbag injury: case report. *Ulus Travma Acil Cerrahi Derg*. 2010;16(2):181–182.
- Afifi I, El-Menyar A, Al-Thani H, Peralta R. Seatbelt versus seatbelt and airbag injuries in a single motor vehicle crash. *Int J Crit Illn Inj Sci*. 2015;5(1):46–49.
- Wallis LA, Greaves I. Injuries associated with airbag deployment. *Emerg Med J*. 2002;19(6):490–493. doi:10.1136/emj.19.6.490.
- Crandall CS, Olson LM, Sklar DP. Mortality reduction with air bag and seat belt use in head-on passenger car collisions. *Am J Epidemiol*. 2001;153(3):219–224. doi:10.1093/aje/153.3.219.
- Petch MC. Driving and heart disease. *Eur Heart J*. 1998;19(8):1165–1177.
- Expert Group on Driving and Cardiovascular Disease. New Standards for Driving and Cardiovascular Diseases. 2013. https://ec.europa.eu/transport/road_safety/sites/roadsafety/files/pdf/behavior/driving_and_cardiovascular_disease_final.pdf. Accessed September 28, 2018.
- Persson D. The elderly driver: deciding when to stop. *Gerontologist*. 1993;33(1):88–91. doi:10.1093/geront/33.1.88.
- Ragland DR, Satariano WA, MacLeod KE. Driving cessation and increased depressive symptoms. *J Gerontol A Biol Sci Med Sci*. 2005;60(3):399–403. doi:10.1093/gerona/60.3.399.
- Marottoli RA, de Leon CFM, Glass TA, Williams CS, Cooney LM Jr, Berkman LF. Consequences of driving cessation: decreased out-of-home activity levels. *J Gerontol B Psychol Sci Soc Sci*. 2000;55(6):S334–S340. doi:10.1093/geronb/55.6.S334.
- Balady GJ, Ades PA, Bittner VA, et al; American Heart Association Science Advisory and Coordinating Committee. Referral, enrollment, and delivery of cardiac rehabilitation/secondary prevention programs at clinical centers and beyond: a presidential advisory from the American Heart Association. *Circulation*. 2011;124(25):2951–2960. doi:10.1161/CIR.0b013e31823b21e2.
- Martin BJ, Hauer T, Arena R, et al. Cardiac rehabilitation attendance and outcomes in coronary artery disease patients. *Circulation*. 2012;126(6):677–687. doi:10.1161/CIRCULATIONAHA.111.066738.
- Suaya JA, Shepard DS, Normand SL, Ades PA, Prottas J, Stason WB. Use of cardiac rehabilitation by Medicare beneficiaries after myocardial infarction or coronary bypass surgery. *Circulation*. 2007;116(15):1653–1662. doi:10.1161/CIRCULATIONAHA.107.701466.
- Farley RL, Wade TD, Birchmore L. Factors influencing attendance at cardiac rehabilitation among coronary heart disease patients. *Eur J Cardiovasc Nurs*. 2003;2(3):205–212. doi:10.1016/S1474-5151(03)00060-4.